KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

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"ENERGY DRINKS" USAGE AMONG LIGHT INDUSTRIAL WORKERS AT SUAMEMAGAZINE, KUMASI: MOTIVATORS AND EFFECTS.

BY

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgement is made in the thesis.

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ABBREVIATIONS AND ACRONYMS

CHRPE	Committee on Human Research, Publication and Ethics
CNS	Central Nervous System
CVD	Cardiovascular Disease
DM	Diabetes Mellitus
ED	Energy Drink
EFSA	European Food Safety Authority
FGD	Focus Group Discussions
KNUST	Kwame Nkrumah University of Science and Technology
NCD	Non-Communicable Disease
PBC	Perceived Behavioural Control
SMA	Suame Municipal Assembly
TPB	Theory of Planned Behaviour
WHO	World Health Organization
FDA	Food and Drugs Authority

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ABSTRACT

Usage of energy drinks has been observed to augment considerably in current years, particularly among occupations such as mining and resources, construction, agriculture and transport where male workers dominate in numbers. However, owing to the high content of caffeine, sugar and other ingredients, concerns have been raised about the perils and possible negative impact of energy drink intake on health, particularly among the youth. This study sought to determine the prevalence of energy drink usage among Light Industrial Workers at the Suame-Magazine in Ghana, some motivators as well as perceived effects. This study used a cross-sectional, quantitative research design. Semi-structured questionnaires were utilized to collect data on socio-demographic characteristics, energy drink usage, motivators and perceived effects. Data was entered and analyzed using STATA 14.2, and graphically represented using Microsoft Word 2016. Categorical variables were mainly expressed as frequencies and percentages while continuous variables were expressed as means and standard deviations. Chi-square was used to test for associations. Prevalence of energy drink usage among this study population was found to be 81.1%. Increasing energy/replenishing lost energy, improving performance and tasting good were the most common motivators for energy drink consumption (75.5%, 66.3% and 60.4% respectively). Overall, insomnia was the most common (21%) perceived effect after consuming energy drink. Usage of energy drink is high among Light Industrial Workers at the SuameMagazine primarily because they are taken to address the physically demanding nature of work within this population. It is recommended that the energy drinks are taken with caution.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

There is no standard definition for the term "Energy drinks". However, Rath (2012) defines them as beverages that contain caffeine, taurine, ginseng, guarana, vitamins, herbal supplements and sugar. For the most part, energy drinks are non-nutritive and usually contain caffeine and sugar in excess amounts (Heckman *et al*., 2010a). For instance, the WHO recommends a maximum of between 6 and 12 teaspoons of added sugar daily. However, some energy drink brands contain about 20 teaspoons of added sugar per 500ml (Stacey *et al*., 2017). Energy drinks comprising ingredients such as caffeine, guarana, taurine, ginseng, theobromine and theophylline have stimulant effects, and they aim to increase alertness, stamina, physical performance and concentration (Shearer *et al*, 2016). Improvement of energy, performance and concentration durations are therefore the common highlights of energy drink advertisements (Heckman *et al*., 2010a).

All over the world, advertisements on energy drinks target the youth which mainly comprise students, athletes and people who work in physically demanding jobs. These young adults are easily enticed by the several tempting energy drink commercials in newspapers and magazines, and on television which energy drink producers utilize (Duchan *et al*., 2010). Findings made by Harris & Munsell (2015) also disclosed that energy drinks are usually publicized with the youth mainly in mind, and the 18-34year age groups is targeted most with a reported consumption frequency of 1–4 energy drinks/months. Bigad (2010) reported that the sales, as well as global intake of energy drinks are constantly growing. Attila and Banu (2011) found that regular usage of energy drinks among adolescents and young adults has a prevalence from 30 to 50 percent.

Light industry comprises manufacturing on a minor scale. It is usually undertaken in places which have a maximum size of a two-car garage. Personal and domestic items, as well as constituents of larger merchandises are therefore the usual products of these industries (Raines, 2017). Due to the lower scale of production, light industries utilize small quantities of raw materials and usually employ manual labor rather than machines for their production (Raines, 2017). It has therefore been observed that workers in light industries habitually consume energy drinks with the intention of increasing their work output.

In a study performed by Dennison *et al.* (2013), usage of energy drinks was observed to have augmented considerably in current years. This observed increase is especially true among occupations such as mining and resources, construction, agriculture and transport where male workers dominate in numbers (Gunda and Brown, 2012). Dennison *et al.* (2013) again found that usage of energy drinks was more likely to occur among workers in professions that entail high physical demands, shift work, long hours, monotonous tasks and those who have more than one job, due to the need to be attentive. Most athletes and manual workers have confidence in energy drinks because of the impression of high physical activity and ability to work, which the "energy drink" term creates (Buxton and Hagan, 2012).

Owing to the high content of caffeine, sugar and other ingredients, concerns have been raised about the perils and possible negative impact of energy drink intake on health, particularly among the youth (Harris & Munsell, 2015). Alcohol are sometimes added to energy drinks by consumers, which is also a public health concern Pomeranz *et al*. (2013). Al-Shaar *et al*. (2017) mentioned that frequent occurrences of sickness, psychological health issues such as restlessness, anxiety, sleep disorders, and some seizure and death cases are influenced by energy drink consumption.

Pomeranz (2011) established that energy drink consumption is associated with high predisposition towards dental caries, weight gain, overweight, obesity, diabetes, gastrointestinal effects and heart disease. The distinctive high content of sugar (9-10%) primarily makes energy drinks calorie dense, in addition to hindering fluid absorption and potentially causing abdominal cramping (Buxton and Hagan, 2012). On one hand, the caffeine content of energy drinks affects sleeping patterns (Shearer *et al*., 2016), while the sugar content, like that of soft drinks, contributes to weight gain and obesity (Gunda and Brown, 2012). Energy drinks also contain stimulants, most of which are diuretics and therefore cause loss of water from the body, leading to dehydration (Polkinghome, 2013). Dehydration in turn reduces physical, psychological and intellectual performance which can lead to accidents, sickness and injury (Adan, 2012).

1.2 STATEMENT OF THE PROBLEM

Diets and lifestyles are changing in Ghana each day because of adoption of foreign cultures with significant consequences of non-communicable diseases. The Ghanaian market has received no exemption from the pervasive advertisements of energy drinks. However, despite the easy accessibility of energy drinks, no significant probing has been made into their consumption patterns, motivators of their usage, effects from usage, and decipher if alarms raised about the negative effects of the stimulant components of energy drinks are valid in Ghana.

The health-related complications linked to energy drink intake among the youth have been greatly discussed by initial articles, especially among college students and athletes. However, inconsiderable amount of research has been done on energy drink consumption among light industrial workers. For instance, Buxton and Hagan (2012) conducted a cross-sectional study to investigate energy drinks consumption practices among students-athletes in Ghana. Out of a total

number of 180 student-athletes in an Inter-University Sports competition, a greater proportion of the respondents (62.2%) recounted drinking at least one can of energy drink in a week. Slightly more than half (53.6%) of the respondents who used energy drinks reported that they took them to renew energy stores after drills or a competition. Other motives stated by the participants as to why they consumed energy drinks included; to provide energy and fluids to the body (25.9%), to improve performance (9.8%) and to reduce fatigue (5.4%).

For this reason, it is essential to magnify the themes of energy drink investigations to comprise wider populations with a variety of demographics. With negligible investigations on energy drink usage among light industrial workers, the prevalence of energy drink usage among this population remains unknown. In addition, reasons for energy drink consumption, as well as effects and risks from energy drink consumption also remain unclear among this population. Knowing these is especially important since lots of marketing strategies promote energy drinks using students, athletes and manual workers.

Therefore, this study aims to ascertain some contributing factors that influence energy drinks usage among light industrial workers at Suame-Magazine, as well as perceived side effects after their usage.

1.3 RESEARCH QUESTIONS

In order to accomplish the aims and objectives of this study, the study sought to answer these questions:

1. What are the various kinds of energy drinks on our Ghanaian market?
2. What are the motivating factors for which light-industrial workers at Suame-Magazine use energy drinks?

3. What are the perceived positive and negative effects of the usage of energy drinks? The answers to the questions will be beneficial for public health experts to design programs in future to avert the implications of a developing public health issue. Again, the information will be helpful in the development of health education intervention programs which will emphasize on the side effects of energy drinks, particularly among light industrial workers.

1.4 STATEMENT OF OBJECTIVES

The principal objective of the study was to assess the extent of usage of the various Energy drinks on the market and identify the motivators and effects among the Light-Industrial workers in Suame-Magazine, Kumasi.

The specific objectives of this study were;

1. To identify the various energy drinks on the Ghanaian market.
2. To identify the factors which motivate light-industrial workers at Suame-Magazine to use energy drinks.
3. To determine the perceived effects of the usage of energy drinks among light-industrial workers at Suame-Magazine.

1.5 JUSTIFICATION OF THE STUDY

Energy drinks are believed to have energizing effects on the central nervous system (CNS) and their usage is usually backed by an anticipation that physical and mental performance of the consumer will be improved (Oteri *et al*., 2007). Globally, one of the commonest consumed alkaloid ingested in coffee, tea or soft drinks, is caffeine. And this when consumed in high quantities may unusually stimulate the nervous system (Dworzariski *et al*., 2009), as well as negatively affect hematologic, cardiovascular and gastrointestinal systems (Seifert *et al*., 2011). The market and

rate of energy drink consumption increases rapidly every year, and only few people have comprehensive knowledge about their possible harmful physiological and psychological effects. Conversely, only few publications currently have the probable perils associated with consuming these beverages recorded (Grosz and Szatmari, 2008). Investigating the light industrial workers' motivators for consuming energy drinks plus the perceived accompanying side effects may reveal a prospective need to increase consciousness of healthrelated issues associated with energy drink intake. After the findings of this study, intensive public health education will be organized to educate the youth on the harmful effects of excess energy drinks consumption. Findings from this study will also add to the sparse body of knowledge on energy drink consumption.

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter presents a critical review of the available literature on the research subject. It looks at the active ingredients of energy drinks, side effects of energy drinks, promotion strategies and the conceptual framework approach to explain the usage of energy drinks.

2.1 ACTIVE INGREDIENTS OF ENERGY DRINKS

Although energy drinks have not been typically defined, they are non-alcoholic drinks which usually contain caffeine, guarana, taurine, ginseng and other ingredients, and are advertised based on their perceived cognitive or physical performance improvement (Breda *et al*., 2014).

2.1.1 Caffeine

The noteworthy sources of caffeine are coffee (*Coffea spp*.), guarana (*Paullinia cupana*), tea (*Camellia sinensis*), mate (*Ilex paraguariensis*), cocoa (*Theobroma cacao*), cola nuts (*Cola vera*), and caffeinated soft drinks as well as energy drinks (Fulgoni *et al*., 2015; European Food Safety Authority, 2015).

Energy drinks provide consumers with an extra burst of energy, especially due to the high quantities of caffeine they contain (Higgins, Tuttle and Higgins, 2010). Caffeine is the commonly consumed, as a central nervous system stimulant by different population clusters such as children, adolescents and adlts (Heckman *et al*., 2010b; Franke *et al*., 2012). Owing to the augmented drinking of coffee and energy drinks such as Red Bull and Monster, the rate of caffeine consumption among adolescents and young adults has escalated since the last decade (McIlvain *et al*., 2011).

Caffeine (1,3,7-trimethylxanthine) is an alkaloid belonging to the methylxanthine family, which is a large class of organic compounds. It naturally occurs in the leaves, fruits and seeds of over sixty-three plant species (Geethavani *et al*., 2014).

In the body, caffeine is readily absorbed and travels to the brain in less than five minutes from its consumption (Baribeau *et al*., 2014). It is also removed from the body with an average half-life of five hours (Heckman *et al*., 2010b). It executes a variety of physiological functions including its effects on the respiratory, cardiovascular, gastrointestinal and central nervous systems (Baribeau *et al*., 2014). Caffeine is generally ingested as a minor nervous chemical stimulant to sleepiness and exhaustion because of its role (Wolde, 2014).

Caffeine has many effects on the human body, both pharmacological and physiological. It has various beneficial effects, including reduced diabetes risk, liver injury (Wolde, 2014), Parkinson's disease, Alzheimer's disease (Messina *et al.*, 2015), improve psychomotor performance, alleviate mood (Giles *et al.*, 2012) and improves overall immune response (Wolde, 2014). On the other hand, it antagonizes the body as it causes addiction, anxiety, insomnia, coronary artery disease, osteoporosis, gastritis, anemia, and other changes in behaviour (Wolde, 2014; Baribeau, 2014). Stacey *et al*. (2017) states that, high intake of caffeine poses dangerous risks to particular vulnerable populations, namely pregnant women and the young and is associated with late miscarriage, small for gestational age infants and still birth.

2.1.2 Taurine

Taurine, which is an important conditional β-aminosulfonic acid, is a nutrient acquired mainly from meat and seafood (Marles *et al*., 2010). Synthesis of bile acid which is indispensable in fat digestion, is the well-known function of taurine (Ebihara *et al*., 2006). The biosynthesis of taurine

has its main site as the liver (Timbrell *et al*., 1995) however immunocytochemical studies have revealed biosynthesis to also occur in other tissues too, for example, cerebellar neurons (Chan-Palay *et al*., 1982) and glial cells, especially astrocytes, and the kidney, but not lymphoid tissue or the lung (Schuller-Levis and Park, 2003).

It is through diet that majority of the taurine necessary for biological function is gained. The amount of taurine ingested from animal sources ranges from 40 to 400 mg/day, primarily meat and seafood (Shao and Hathcock, 2008). Taurine is also present in human milk (Verner, McGuire and Craig, 2017). Taurine is important for immune function, glucose metabolism, heart function and nervous system health (Lourenço and Camilo, 2002). Taurine dietary supplementation is not required for a healthy human since dietary intake and biosynthesis is usually sufficient to meet physiological needs (Reeds, 2000). However, the supplementation of taurine is suggested in cases of digestive malabsorption where there may be a restriction in the supply of precursor amino acid and significant losses of bile acids and taurine may occur in stools, such as in kids with cystic fibrosis, people with blind loop gut syndrome, and choleric diarrhea (Van de Poll *et al*., 2006).

Some effects of taurine in the body include proliferating hormones of the body, augmenting physical activities particularly the workout abilities, and showing some biological effects (Giles *et al*., 2012). According to Giles *et al*. (2012), the cerebral abilities and biological functions of mice in vitro are improved by taurine.

Heckman *et al*. (2010a) states that as high as 80 different types of energy drinks that had high amounts of taurine frequently were equal to 753mg for each 30ml.

2.1.3 Guarana

Guarana (Paullinia cupana), a species of climbing plant native to the Amazon. It is a traditional medicinal species known for its functional abilities as an antioxidant and an effective stimulant (Schimpl *et al*., 2013). Caffeine present in guarana is the main component that is attributed to these beneficial properties, which, depending on how the extract is prepared, can be more than four times the amount of caffeine obtained in coffee beans (Schimpl *et al*., 2013). According to Heckman *et al* (2010a), he adds from every one gram of guarana it could produce more than 40 milligrams of caffeine. For centuries, the Amerindian tribes have used guarana for several indications including: stimulant, preventive for arteriosclerosis, pain reliever, cardiovascular drug, astringent, aphrodisiac, tonic, to treat diarrhea, fever, migraine, neuralgia hypertension, and dysentery (Taylor, 2005). Taylor (2005) added that over the last few decades, guarana seed extracts have become extremely popular across the world primarily for their stimulant and thermogenic actions, as constituents in many herbal formulas, energy drinks, and protein bars (Taylor, 2005).

There are various double-blind, placebo-controlled studies in human subjects that have revealed that guarana improves some parameters of cognitive performance with no effects on mood (Kennedy, 2004), increases speed and accuracy of performing rapid visual information processing tasks and attenuates mental fatigue associated with extended task performance (Kennedy, 2008), enhances secondary memory performance and increases alert and some content mood ratings (Haskell *et al*., 2007). A 2007 human pilot study assessed acute behavioural effects to four doses (37.5 mg, 75 mg, 150 mg and 300 mg) of guarana extract. For individuals on the two lower doses, memory, alertness and mood were increased, indicating that there is cognitive improvement following 75mg guarana (Haskell *et al*., 2007).

To conclude, the side effects of guarana has not been confirmed yet by any single study, either by consuming in higher quantities for a short period or smaller quantities in long periods (Heckman *et al*., 2010). Increased risk of cardiac toxicity, anxiety, nausea, seizures can occur if guarana is consumed in large amounts for a long-term, that can be greater than seven days (Fetrow & Avila, 1999). Depending on a particular side effects that occurs the dose of guarana matters, doses greater than 250-300mg daily have been associated to side effects (WebMD, 2019).

2.1.4 Ginseng

Ginseng is a perennial herb (Araliaceae family) that belongs to the genus Panax. It is a popular medicinal plant and it is highly valued (Kim *et al*., 2018). Ginseng is known to perform the following functions as boosting general well-being, improve immune function, increase libido, and improve athletic performance (Chhotaram *et al*., 2010). For a long time, ginseng is used mainly for treating, returning homeostasis, and enhancing long life, but more currently it has been found out that the herb ginseng is used for regulating heart diseases factors (Attele *et al*., 1999).

Chhotaram *et al*. (2010) still argues that ginseng has been effective in improving the body's mechanism in managing stress and to increase vitality. Asian ginseng (*Panax ginseng Meyer*) is the most frequently used and well accepted therapeutic herb among the thirteen ginseng species identified (Kim *et al*., 2018). To be more specific, some species of Korean red ginseng, a kind of Asian ginseng, have been identified to enhance blood sugar control and some cardiovascular parameters when used in addition to prescribed medications (Vuksan *et al*., 2008). After a preliminary double-blind, crossover study of Korean red ginseng's effects on impotence conducted by Yun *et al*. (2001) he concluded that it can be an effective option for the management and treatment of male erectile dysfunction.

In very few reports, inflammation of blood vessels in the brain may have been linked to usage of Panax ginseng, and this could result in headaches or strokes (Chhotaram *et al*., 2010). Other side effects associated with taking Panax Ginseng which includes blood pressure changes, heart rate changes, insomnia, diarrhea itching, loss of appetite, headache, nervousness, mood changes are generally mild and temporary and mostly diminish after a few days (Chhotaram *et al*., 2010).

According to Wang *et al*. (2016), he argues that an increasing number of researches have proven the efficacy of ginseng components extracted from ginseng leaves, fruits and roots in reducing or blocking neuronal death in various experimental neurodegeneration models. The presence of ginsenosides in ginseng attributes to its beneficial effects as powerful antioxidants and free iron scavengers (Kim *et al*., 2018).

2.1.5 Sugars and Sugar Substitutes

The body's main fuel is sugars but excess intake of it can get you hyperactive, and energy drinks are packed with them (González *et al*., 2012). Excess sugars as found in energy drinks may interrupt metabolic balance (González *et al*., 2012). Beverages and drinks which are sugar sweetened have been demonstrated to be a factor in the occurrence and development of overweight and obesity, type 2 diabetes, dental caries in children and adolescents, tooth decay, bone fractures, pancreatic cancer, gastro esophageal reflux, cardiovascular diseases, metabolic syndrome and hypocalcaemia (Gimba *et al*., 2014).

Sugar substitutes may be included in so many foods, drinks and drugs and it is popularly known as artificial sweeteners (Gimba *et al*., 2014). One of the commonly used sugar substitutes known as aspartame is a white crystalline powder is highly sweet and odourless. It is approximately 200 times sweeter than sucrose, the accepted standard for sweetness (Gimba *et al*., 2014). Studies have

shown that there are negative neurological effects of aspartame which include headache, insomnia and seizures after ingestion of aspartame, occasionally causing brain damage, which are also accompanied by the alterations in regional concentrations of catecholamine (Gimba *et al*., 2014).

2.1.6 B Vitamins

B Vitamins or vitamin B complex, a group of water-soluble vitamins that are very essential in cell metabolism (Kaur, 2015). The B vitamins comprises of thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine hydrochloride (B6), biotin (B7), insoitol, and cyanocobalamin (B12) (Heckman *et al*., 2010a). The key B vitamins that are added in energy drinks are: B2, B3, B6, and B12 (Heckman *et al*., 2010a). Each one of these four vitamins has a unique function to play in the body.

Vitamin B2 (Riboflavin): It is essential for the digestion and metabolism of carbohydrates, protein and fats, and is also needed for cell respiration. Vitamin B2 is necessary for the formation of erythrocytes and antibodies and promotes good vision, healthy skin, nails and hair. It also enhances growth and reproduction and also serves as a de-stressor (Kaur, 2015).

Vitamin B3(Niacin): Studies have revealed that, niacin is helpful in reducing high blood pressure, lowering serum cholesterol, preventing excess fatty buildup in the liver, maintaining the nervous system and aiding to reduce depression. Niacin is needed for proper circulation and healthy skin, mostly when vitamin C is taken as enhancers (niacin has a likelihood to cause flushing and warm and tingling sensation) (Kaur, 2015).

Vitamin B6 (Pyridoxine): For reducing the risk of arteriosclerosis and stroke, pyridoxine is said to play a role. Vitamin B6 aids in fat and carbohydrate metabolism and also important in the

formation of antibodies. It is needed for the synthesis and breakdown of amino acids, (the basic blocks of protein). It also promotes healthy skin, reduces muscle spasms, carpal tunnel syndrome, leg cramp and numbness of the hands (Kaur, 2015).

Vitamin B12 (cobalamin or cyanocobalamin): It is said to help in the formation and regeneration of erythrocytes and preventing anaemia. Vitamin B12 also aids in calcium absorption and carbohydrate, fat, and protein metabolism. It helps to keep a healthy nervous system, promotes growth and development in children and increase energy (Kaur, 2015).

2.2 SIDE EFFECTS OF ENERGY DRINKS

Consumers, especially the young generations are easily attracted by energy drinks because of its claim to improve their energy; however, some of its customers are ignorant of their side effects on health (Al-Shaar *et al*., 2017). An increasing number of studies confirms to the short term health benefits of energy drinks in improving mental and physical stamina and performance among both young adults and adolescents. Numerous randomized controlled trials among adults have shown an association between constituents of energy drinks and improved subjective alertness (Alford *et al*., 2001), as well as increasing energy restoration of fatigue (Howard *et al*., 2010). A meta-analysis conducted by Howard *et al* (2010) on the acute-effects of energy drinks among adults found that energy drinks consumption improved muscle strength and endurance, performance on endurance exercise tests, jumping, and sport-specific actions.

Primarily, with respect to caffeine and sugar, several studies have demonstrated the short-term effects of energy drinks on the cardiovascular system (Grasser *et al*, 2016). For instance, a recent randomized crossover study on healthy subjects found that consumption of 355 mL of an energy drinks resulted in increased systolic and diastolic blood pressure, heart rate, and cardiac output

(Grasser *et al*, 2014). Similarly, a 2016 meta-analysis of 15 studies proved that acute energy drinks consumption resulted in increase in both systolic and diastolic blood pressure across the pooled results (Shah *et al*., 2016). For increased heart rate the meta-analysis did not find evidence for it, hence the researchers noted the essence for well-designed studies before any conclusions can be made.

Studies have suggested that energy drinks consumption is also related with other frequently reported health problems such as sleep disturbances (insomnia) and late bedtime, tiredness/fatigue, headaches, and stomach aches and irritation (Koivusilta *et al*., 2016; Holubcikova *et al*, 2017). In a comparative cross-sectional study conducted in Finland by Koivusilta *et al*. (2016), consumers of energy drinks had a 4.6 (95% CI: 2.8, 7.7) times greater odds of headaches, 3.6 (95% CI: 2.2, 5.8) times greater odds of sleeping problems, and 4.1 (95% CI: 2.7, 6.1) times greater odds of having an irritable mood compared to non-consumers.

2.3 MARKETING STRATEGIES

Marketing is said to be customer benefit relationship management. For the success of any company, it may be said and proven that sound marketing is critical (Reshidi, Fejza and Durmishi-devetaku, 2016). Alsunni and Badar (2011) explains that the marketing of these energy drinks mainly relies on the claims that the natural constituents in energy drinks provides increased energy, increased alertness, and improved athletic performance.

Although energy drinks are marketed by direct advertising in sales outlets, energy drink companies also use recent and modern marketing methods, such as internet advertising (e.g. the brand or the company's social media sites), contests, sponsorships and partnerships through sporting and cultural events (Simon and Mosher, 2007). Simon and Mosher (2007) still argues that themes

linked to rebellion, risk-taking, and adventure which attracts the teenagers and youth are also marketing strategies these companies exploit (Simon and Mosher, 2007). Also, high intense sports events such as football, boxing and wrestling and musical styles with youth appeal (e.g., dancehall and hip-hop) are often associated with energy drink companies (Simon and Mosher, 2007).

Messages about the risks and potential adverse effects associated with the use of energy drinks always take a back seat, whiles the acclaimed health beneficial effects of energy drinks are overrepresented in advertising strategies. In recent times, more low priced brands have emerged faster to attract those who do not want to purchase high priced market leaders (Alsunni and Badar, 2011).

One may assume that energy drinks can be consumed in large and unlimited quantities because of their marketing strategies, without any regard for the consumer's age or state of health to get the desired effects. (Qu *et al.*, 2013). This being the case, consumers may fail to pay attention to the warnings and the conditions of use that accompany these drinks or minimize their importance (Qu *et al.*, 2013).

Since there is lack of regulatory oversight and aggressive marketing by the energy drinks companies, the negative health effects associated with energy drinks are worsened (Al-Shaar *et al*., 2017). It is sad how energy drink manufacturers are left to ascertain their product's safety, and there is no proper strict instruction on what is to be written on their brand label (for example cautions, antagonistic outcomes, testing, or prohibitions against sales or usage by juveniles) (Seifert *et al.*,2011).

Various tempting marketing tactics, for instance appealing packaging, brand misunderstanding and providing cheaper substitutes are employed to promote alcoholic energy drinks (Simon and Mosher, 2007). Energy drinks either alcoholic or non-alcoholic are usually produced in either cans and bottles that make use of neat and bright graphics, amazing type style, and list sugary, fruity tastes (Simon and Mosher, 2007). Additionally, some businesses play upon a consumer's brand loyalty by producing non-alcoholic energy drinks as well as the same drink mixed with alcohol (Simon & Mosher, 2007).

2.4 CONCEPTUAL FRAMEWORK APPROACH

Health behaviours are complex and multifaceted. Using a conceptual approach to heighten the understanding of the motivation behind light industrial workers' energy drink (with and without alcohol) consumption, is therefore necessary. The theory of planned behaviour has been utilized in this study as an inherent origin to understand energy drink consumption among light industrial workers, in terms of intent and associated influencing factors. The Theory of Planned Behaviour entails a person's resolution to participate in a definite behaviour (Ajzen, 1991), and many health behaviours have been targeted by using it in health promotion (Frost, 2008).

Generally speaking, the stronger the purpose, the more prospects of a behaviour being executed (Ajzen, 1991). Ajzen (1991) asserts: "Intentions to perform behaviours of different kinds can be predicted with high accuracy from attitudes toward the behaviour, subjective norms, and perceived behavioural control; and these intentions, together with perceptions of behavioural control account for considerable variance in actual behaviour".

An illustration of this theory is shown below in Figure 2.1:

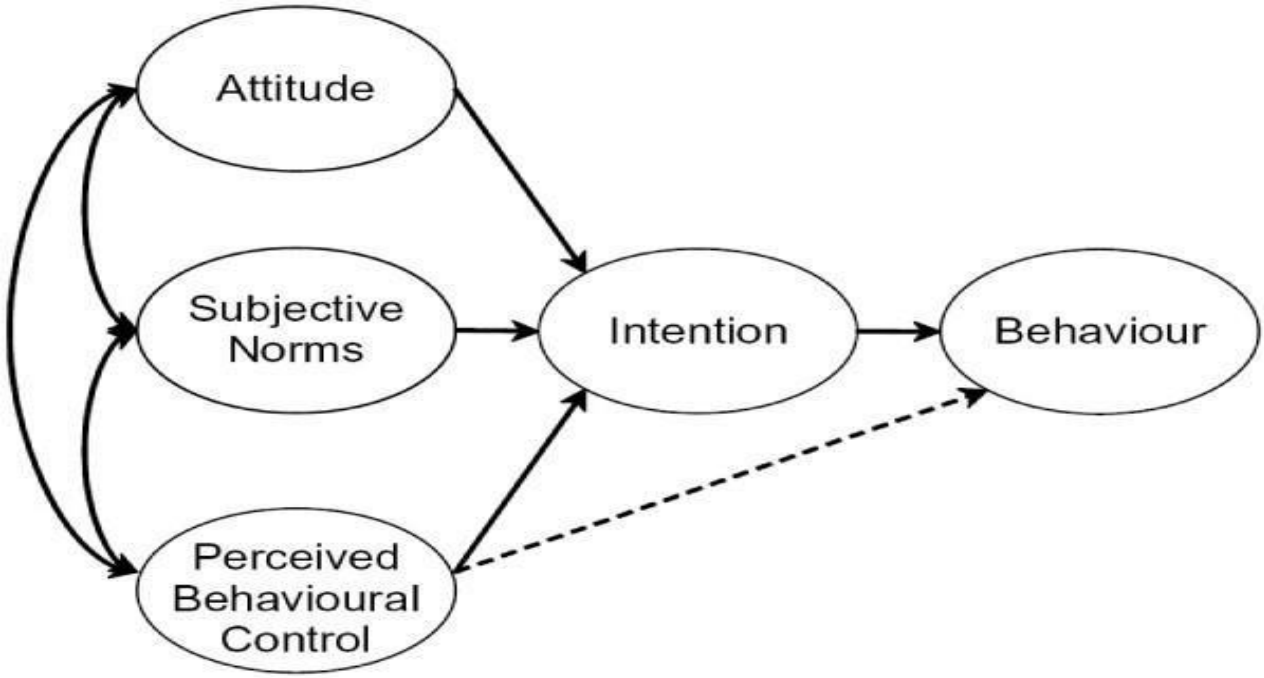


Figure 2.1: Ajzen Theory of Planned Behaviour

Elaborating on some of the fundamental ideas of the Theory of planned Behaviour aided in developing a conceptual framework to direct the objectives of this research. As demonstrated in figure 2.1 above, the Theory of planned Behaviour explains that individual behaviour is stirred by one's intentions for a behaviour. Ajzen (1991) states that a function of three constructs: a person's attitude toward behaviour, subjective norms, and perceived behavioural control brings about behaviour intention.

According to Ajzen (1991), Attitude refers to the degree to which a person has a favourable or unfavourable evaluation of the behaviour of interest. It entails a consideration of the outcomes of performing the behaviour. In terms of subjective norm, Ajzen (1991) states that, Subjective norm refers to the belief about whether significant others approve or disapprove of the behaviour. It relates to a person's perception of the social environment thinking about whether he or she should

engage in the behaviour. Lastly, in terms of perceived behavioural control, Ajzen (1991) writes that, perceived behavioural control refers to the individual's perception of the ease or difficulty of performing a behaviour of interest. It varies across circumstances and actions based on how people perceive that they have more assets and confidence.

Questions which were similar to these constructs where asked from the participants so as to get a better insight into light industrial workers' intention and connected motivators toward energy drink usage. In behaviour change and health promotion, there is the necessity of using a conceptual and/or theoretical approach (DiClemente *et al*., 2002). This theory was intended to be used as a highlight for some of the probable motivating factors connected to light industrial workers' consumption of energy drinks. Results from this study may support prospective investigations on energy drink consumption among manual workers including other light industrial workers to vividly communicate theoretical concepts which may be used as a prognostic model for consumption of energy drinks.

CHAPTER THREE

3.0 MATERIALS AND METHODS

This chapter addresses the study design, sampling, the data collection instruments, the participants, and procedures of data collections and analysis. Also, it describes the statistical measures that were used during the data analysis process.

3.1 STUDY TYPE

This study made use of a cross-sectional, quantitative research design and data was collected through the use of a self-report, paper and pencil questionnaire. The questionnaire was developed from subjects in the literature available, as well as formerly developed questionnaires to collect data about energy drinks usage among light industrial workers. The questionnaire designed obtained data on light industrial workers' socio-demographic data, energy drink consumption patterns, factors associated with energy drinks usage and perceived effects of energy drinks usage. Structured questionnaire was administered by the researcher during the working hours.

Data was collected between July and August, 2019 from respondents.

3.2 STUDY AREA AND TARGET POPULATION

The study was conducted at the Suame-Magazine environs in the Kumasi Metropolis in the Ashanti Region of Ghana.

Suame Magazine is in the Suame Municipality. Suame is a major suburb in Kumasi, where Kumasi is the Ashanti Region's capital. There were military armories (or magazines) located in the area of Suame during the colonial times, hence the term "Magazine" came about as a historical reference term (Adu-Gyamfi and Adjei, 2018). To locate Suame Magazine, it lies on the side and bottom of a hill to the east of the principal road to the northern regions of Ghana, and to the west of a creek. Another distinctive landmark when entering the Suame Magazine by the principal road from the

Kumasi Central Market is the sloping landscape of the Suame roundabout, which is the biggest roundabout in Kumasi. The trapezoidal-shaped area is approximately1.80 kilometres long with an average width of 320 metres. Suame Magazine is constantly increasing in population and is presently over crowded with a total population of about 200,000 artisans occupying a land size of 2,371,899 (585.85 acres) (Adu-Gyamfi and Adjei, 2018).

Suame Magazine is an automobile industrial urban sprawl, which was not planned for, but has been left to evolve on its own. In Ghana, Suame Magazine is one of the popular automobile market for drivers and car owners across the country, especially in the Ashanti Region, and other neighbouring countries. Over the years, Suame Magazine has gained some high credibility for solving any automobile technical problem. The artisans at the Suame Magazine service and repair about 80% of the cars on our roads (Adu-Gyamfi and Adjei, 2018).

The major sectors of the Suame Magazine Cluster can be classified into manufacturing, vehicle repair and maintenance, metal working, sale of engineering materials and accessories and sale of automobile spare-parts (Adu-Gyamfi and Adjei, 2018).

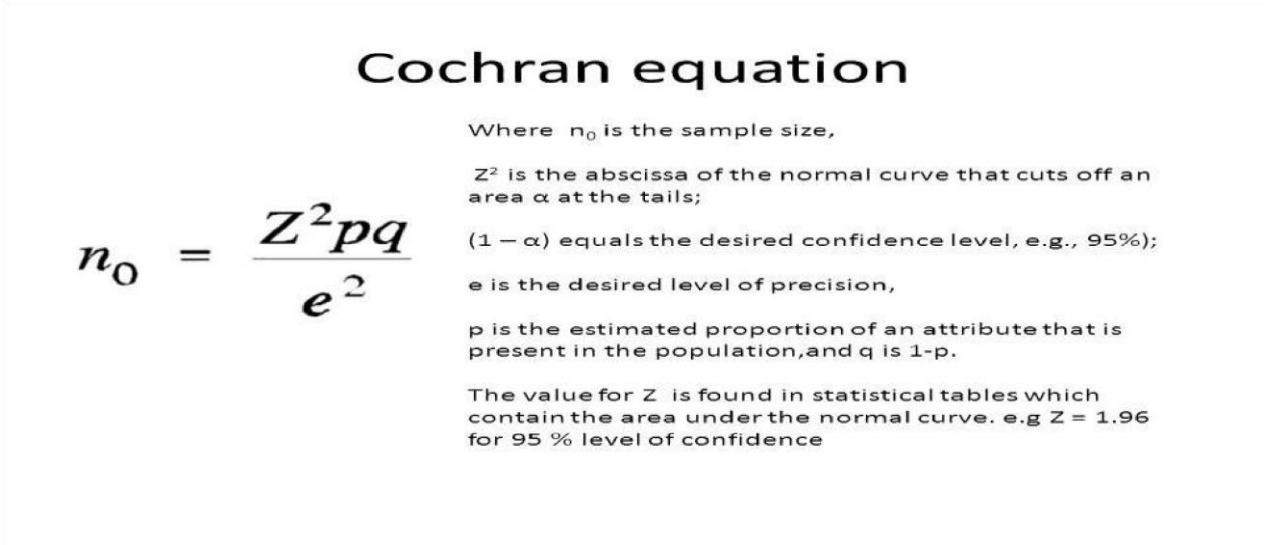
The target population was only the light industrial workers at the Suame-Magazine and excluded other traders and customers.

3.3 SAMPLE SIZE

The study sample was a probability sample of light industrial workers in the Suame-Magazine environs during the time of the data collection.

Calculation

The sample size was calculated from the target population by adopting the Cochrane's formula for proportions. This formula is stated as:



Adapted from (Cochran, 1977).

Figure 3.1 Cochran formula for Sample size determination

Based to this formula, it is assumed that the proportion of a phenomenon is 50% if it is unknown in a population as this is the highest variability and results in the largest sample size results. So, the prevalence of energy drink usage in the hypothesized population used in this calculation was 50% (that is p=0.5). To add to it, taking into account a confidence interval of 95% (z= 1.96), with precision of ±5%, the minimum sample size of the hypothesized population was calculated as:

$$n \geq \frac{1.962 \times 0.5\ (1- 0.5)}{(0.05)^2}$$

$$\geq 384.16$$

$$= 385$$

To make room for incomplete responses from participants, 10% of the sample size was added.

= 10% of 385 = 38.5

Total Sample Size = 385 + 39

= **424**

3.4 SAMPLING STRATEGY AND RECRUITMENT

Cluster sampling technique was used to obtain a sample size which was a true reflection of the target population. In this sampling technique, the population was first divided into clusters, and then a sample was selected from the clusters randomly.

Adu-Gyamfi and Adjei (2018) stated that the Suame-Magazine has been partitioned into a total of twelve (12) zones; 1-7, 11-13,18 and 19. The rapid appearance of new Informal Industrial Clusters is the reason for the irregular system of numbering. Based on the clusters (number of zones) and sample size, 35 participants were interviewed in ten zones whilst 37 participants were interviewed in two zones. In each zone, respondents were interviewed purposively based on availability and willingness to participate in the study.

3.4.1 Inclusion Criteria

Light Industrial Workers at the Suame-magazine who were Ghanaians aged 18years and above, and were willing to participate in the study were recruited.

3.4.2 Exclusion Criteria

Light Industrial workers who had health issues such as diabetes and hypertension which restricted their diets were excluded.

3.5 DATA COLLECTION TECHNIQUES AND TOOLS

Structured interviews, questionnaires, and focus group discussions (FGD) guide are some instruments used for data collection (Adjei, 2013). Results from this source formed the basis of data analysis. Literature sources including books, handouts, newspapers, journals, magazines, the internet etc. were reviewed and the information obtained used to discuss the results generated from the primary data analysis.

3.5.1 Recruitment and Training of a Field Assistant

A field assistant was engaged and trained by the researcher of the collection of data. The field assistant was a trained nutritionist by profession.

3.5.2 Semi-structured Questionnaire

As part of the process of gathering data relevant to the study's objectives and research questions, a semi-structured questionnaire (attached as appendix II) was designed as a data collection tool.

3.5.3 Development of the Questionnaire

Literature review indicated that different categories of people have different factors or motivators that influence their usage of energy drinks. This study attempted to assess the extent of usage of the various Energy drinks on the market and identify the motivators and effects among the LightIndustrial workers. The questionnaire was based on the literature review and similar instruments used in other studies.

The questionnaire was discussed with the researcher's supervisor after its draft was completed and with a professional nutritionist working in a district hospital. Comments and changes made by these experienced persons were noted and the draft questionnaire modified accordingly.

3.5.4 Structure of the Questionnaire

The items contained in the questionnaire were made up of both open-ended and closed-ended questions, which attempted to identify patterns of energy drinks usage, motivators and perceived effects of energy drinks usage among the subjects. The questionnaire consisted of the following six sections: Personal data of respondents, socio-demographic information, various kinds of energy drinks consumed, frequency of energy drinks consumption, motivators that influence the usage of energy drinks and perceived effects after consuming energy drinks.

3.5.5 Reliability and Validation of the Questionnaire

The questionnaire, after having been written, was pre-tested on 20 respondents in Asafo Magazine in the Kumasi Metropolitan in the Ashanti Region of Ghana where we have similar subjects of our study. The purpose was to ensure that the questions posed were understood by all participants in the same way. The pre-test questionnaire was administered to Light Industrial workers of the same category, to evaluate consistency in responses and modify questions with ambiguity, as well as standardize the questions, in order to eliminate variations which may affect the reliability of the tool (Boynton, 2004). Both face and content validity of the questionnaire were evaluated. Content validity was achieved by adopting a number of internationally standardized questions for the components of the questionnaire, while the face validity was achieved by showing the tool to the supervisor, a nutritionist and a statistician, to assess what it intends to measure.

3.6 DATA ANALYSIS

Collected data was entered, cleaned and analysed using STATA (version 14.2). Descriptive and frequency statistics were determined. Chi-squared analyses were used to assess relationships between energy drink usage, adverse effects and other factors affecting energy drink use, and to

verify predictors of energy drink use. The results obtained from the information were explicitly discussed with appropriate references to literature where necessary.

3.7 ETHICAL CLEARANCE

3.7.1 Permission to Conduct the Study

The research involved an interaction with Light Industrial workers in the Suame Magazine environs of the Suame Municipality. Approval was therefore sought from management of the Suame Municipal Assembly.

Informed consent and permission to participate was obtained from each participant. Participants also had the liberty to withdraw from the study anytime they deem necessary. Moreover, participants were at liberty to choose not to answer particular questions they were uncomfortable with. Strict confidentiality of the identity of respondents was maintained using unique numeric codes which were only available to the principal investigator. Completed data collection tools will be retained until the final work has been submitted and approved.

3.7.2 Ethical Clearance Letter

Prior to the start of the study, ethical approval (Ethical Reference Number: CHRPE/AP/418/19) was received from the Committee on Human Research, Publication and Ethics (CHRPE) of the School of Medical Sciences, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi.

CHAPTER FOUR

4.0 RESULTS

This chapter presents findings from the research. These findings are presented under the following sections; socio-demographic information of study participants, prevalence of energy drink consumption and various energy drinks on the Ghanaian market, consumption patterns for non-alcoholic and alcoholic energy drinks, factors influencing energy drink consumption and perceived effects after consuming energy drinks.

4.1 SOCIO-DEMOGRAPHIC INFORMATION OF STUDY PARTICIPANTS

Table 4.1 provides information on the background characteristics of workers at the Suame Magazine who were recruited in this study. Majority (89.2%) of the study participants were males. The mean age of study participants was 31.50 ± 10.40 years with 18-29 years being the commonest (50.5%) age range while the 50-59years age bracket was the rarest (2.8%). Study participants were predominantly (75.9%) Akans while Nzema and Ga-Adangbe together were the least popular (1.2%) ethnic groups. 7.1% of study participants had attained tertiary education while the same percentage had no formal education. The highest (37.8%) portion of study participants engaged in sale of Engineering materials and automobile spare-parts as their source of livelihood, and mainly (59.4%) earned from ¢200 to ¢999 in a month.

Table 4.1: Socio-demographic information of study participants (N=424)

Variable	n (%)

Sex	
Male	378(89.2)
Female	46(10.8)
Age(years)	
Mean	31.50 ± 10.40
18-29	214(50.5)
30-39	137(32.3)
40-49	47(11.1)
50-59	12(2.8)
≥60	14(3.3)
Ethnic group	
Akan	322(75.9)
Ewe	12(2.8)
Northerner	85(20.1)
Others	5(1.2)
Highest Educational Level	
None	30(7.1)
Elementary School	206(48.6)
Senior High	158(37.2)
Tertiary	30(7.1)
Category of Work	
Manufacturing	31(7.3)
Vehicle Repair	149(35.1)
Metalworking	73(17.2)
Sale of Engineering materials and automobile spare-parts	160(37.8)
Electrical Engineering	11(2.6)
Average Monthly Income	
<¢200	25(5.9)
¢200 - ¢999	252(59.4)
¢1000 - ¢2499	115(27.1)
¢2500 – 4999	28(6.6)
≥5000	4(1.0)
Average working hours per week	58.58 ± 10.02

Other ethnic groups=Nzema and Ga-Adangbe

4.2 PREVALENCE OF ENERGY DRINK CONSUMPTION AND VARIOUS ENERGY DRINKS ON THE GHANAIAN MARKET

Majority (81.1%) had taken in energy drink within the period under study. Almost half (47.5%) of the 18.9% who had not consumed energy drink within the period under study, said they had not because they thought energy drinks might not be healthy. Storm energy drink was the most (27.9%) patronized while Rush energy drink was the least (0.9%) patronized.

Table 4.2: Prevalence of Energy drink consumption and various brands of energy drinks on the Ghanaian market (N=424)

Variable	N (%)
Do you consume energy drinks?	
Yes	344(81.1)
No	80(18.9)
If no, why?	
I heard they do not taste good	2(2.5)
They are expensive	10(12.5)
They might not be healthy	38(47.5)
I'm just not interested in them	26(32.5)
I heard/saw that one does not feel okay after drinking them	4(5.0)
Brand of energy drink consumed most	
Red Bull	10(2.9)
5 Star	81(23.6)
Run	48(13.9)
Coca-Cola	22(6.4)
Blue Jeans	23(6.7)
Lucozade	46(13.4)
Storm	96(27.9)
Rox	9(2.6)
Wellman	6(1.7)
Rush	3(0.9)

4.3 CONSUMPTION PATTERNS FOR NON-ALCOHOLIC AND ALCOHOLIC ENERGY DRINKS

Study participants mostly consumed energy drinks on a weekly basis with a mean weekly intake of 4.55 ± 2.72 cans of non-alcoholic and 2.88 ± 1.64 cans of alcoholic ones. Alcoholic energy drinks were not consumed on a daily basis.

Table 4.3 Mean consumption for non-alcoholic and alcoholic energy drinks

Variable	Mean ± SD
Mean consumption for non-alcoholic (number of cans)	
Daily	2.33 ± 1.13
Weekly	4.55 ± 2.72
Monthly	2.38 ± 1.45
Mean consumption for alcoholic (number of cans) Weekly	2.88 ± 1.64
Monthly	2.00

None consumed the alcoholic energy drinks daily, alcoholic=energy drink mixed with alcohol, One (1) can of energy drink=250ml.

4.4 FACTORS INFLUENCING ENERGY DRINK CONSUMPTION

On one hand, increasing energy/replenishing lost energy, improving performance and tasting good were the most common (75.5%, 66.3% and 60.4% respectively) reasons participants agreed to for consuming energy drinks. On the other hand, compensating for insufficient sleep, not being able to function without energy drink and drinking them without specific reasons were the factors most disagreed to (84.6%, 85.2% and 85.4% respectively).

Table 4.4 Factors influencing consumption of energy drinks(N=344)

Factors (Motivators)	Disagree	Neutral	Agree
Compensate for insufficient sleep	291(84.6)	13(3.8)	40(11.6)
Increase/Replenish energy	80(23.3)	4(1.2)	260(75.5)
Improve mood	267(77.6)	13(3.8)	64(18.6)
Improve performance	111(32.2)	5(1.5)	228(66.3)
Hydration of the body	278(80.8)	9(2.6)	57(16.6)
Energy drinks are affordable	177(51.4)	13(3.8)	154(44.8)

My friends influenced me	264(76.8)	7(2.0)	73(21.2)
I can't function without energy drinks	293(85.2)	10(2.9)	41(11.9)
Athletes and celebrities drink energy drinks, so do I	263(76.5)	10(2.9)	71(20.6)
Energy drinks mean youth and strength	259(75.3)	11(3.2)	74(21.5)
Energy drinks taste good	113(32.9)	23(6.7)	208(60.4)
Help me to work for long hours	162(47.1)	20(5.8)	162(47.1)
I am enticed by their commercials	257(74.9)	7(2.0)	79(23.1)
I like trying new products that's why I drink energy drinks	254(74.0)	13(3.8)	76(22.2)
Energy drink containers are appealing to the eyes, so they are attractive to me	255(74.1)	17(4.9)	72(21.0)
Drink them without specific reason	294(85.4)	14(4.1)	36(10.5)
To recover from illness	218(63.4)	19(5.5)	107(31.1)

4.5 ASSOCIATION BETWEEN SOCIO-DEMOGRAPHIC INFORMATION AND CONSUMPTION OF ENERGY DRINK

Out of the socio-demographic information of study participants taken, only category of work was found to be significantly associated with Consumption of energy drink ($p<0.05$).

Table 4.5: Chi-square test of association between background information and being a consumer or non-consumer of energy drinks (N=424)

Variable	Consumer n(%)	Non-consumer n(%)	Chi-Square (χ^2)	p-value
Gender				
Male	309(72.9)	69(16.3)	2.6325	0.105
Female	33(7.8)	13(3.1)		
Age Category				
18-29	176(41.5)	38(9.0)	4.4302	0.323[a]
30-39	110(25.9)	27(6.4)		
40-49	39(9.2)	8(1.9)		

50-59	8(1.9)	4(0.9)		
60-70	9(2.1)	5(1.2)		
Ethnic group				
Akan	258(60.9)	64(15.1)	1.3276	0.810[a]
Ewe	11(2.6)	1(0.2)		
Northerner	69(16.3)	16(3.8)		
Others	4(0.9)	1(0.2)		
Highest Educational Level				
None	23(5.4)	7(1.7)	3.0274	0.387
Elementary School	167(39.4)	39(9.2)		
Senior High	131(30.9)	27(6.4)		
Tertiary	21(4.9)	9(2.1)		
Category of Work				
Manufacturing	29(6.8)	2(0.5)	**13.4690**	**0.006[a]**
Average Monthly Income				
<¢200	17(4.0)	8(1.9)	3.2775	0.441[a]
	203(47.9)	49(11.6)		
	96(22.6)	19(4.5)		
	23(5.4)	5(1.2)		
	3(0.7)	1(0.2)		
Vehicle Repair	114(26.9)	35(8.3)		
Metalworking	67(15.8)	6(1.4)		
Sale of Engineering materials and automobile spare-parts	122(28.8)	38(9.0)		
Electrical Engineering	10(2.3)	1(0.2)		
¢200 - ¢999				
¢1000 - ¢2499				
¢2500 – 4999	≥5000	[a] = Computed using Fischer's exact test, significant at $p < 0.05$.		

4.6 ASSOCIATION BETWEEN GENDER AND REASONS FOR ENERGY DRINK CONSUMPTION

The popular reasons for which energy drinks are known; increase/replenish energy, improve performance and working for long hours were all found to be significantly associated with gender ($p<0.05$). Overall, males were likely to take energy drinks for these three popular reasons than females.

Table 4.6: Chi square test of association between Gender and motivators factors for consuming energy drinks (N=344)

Reason	Male n(%)	Female n(%)	Chi-Square (χ^2)	p-value
Increase/replenish Energy				
Disagree	67(19.5)	13(3.8)	**6.0683**	**0.032[a]**
Neutral	3(0.9)	1(0.3)		
Agree	240(69.7)	20(5.8)		
Improve performance				
Disagree	90(26.2)	21(6.1)	**15.1988**	**0.001[a]**
Neutral	5(1.4)	0(0)		
Agree	215(62.5)	13(3.8)		
Work for long hours				
Disagree	141(41.0)	21(6.1)	**7.4298**	**0.017[a]**
Neutral	16(4.6)	4(1.2)		
Agree	153(44.5)	9(2.6)		

[a] = Computed using Fischer's exact test, significant at $p < 0.05$.

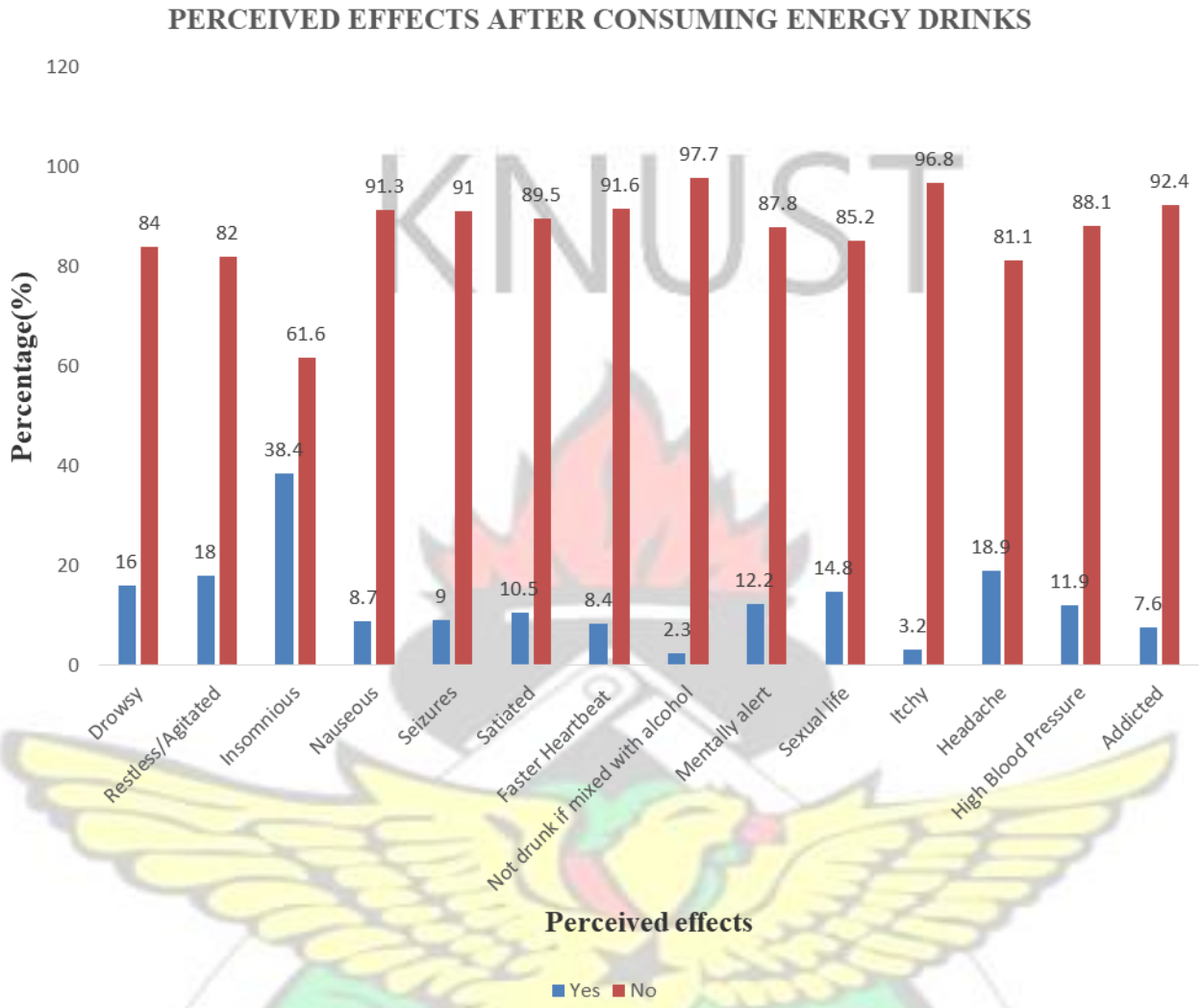
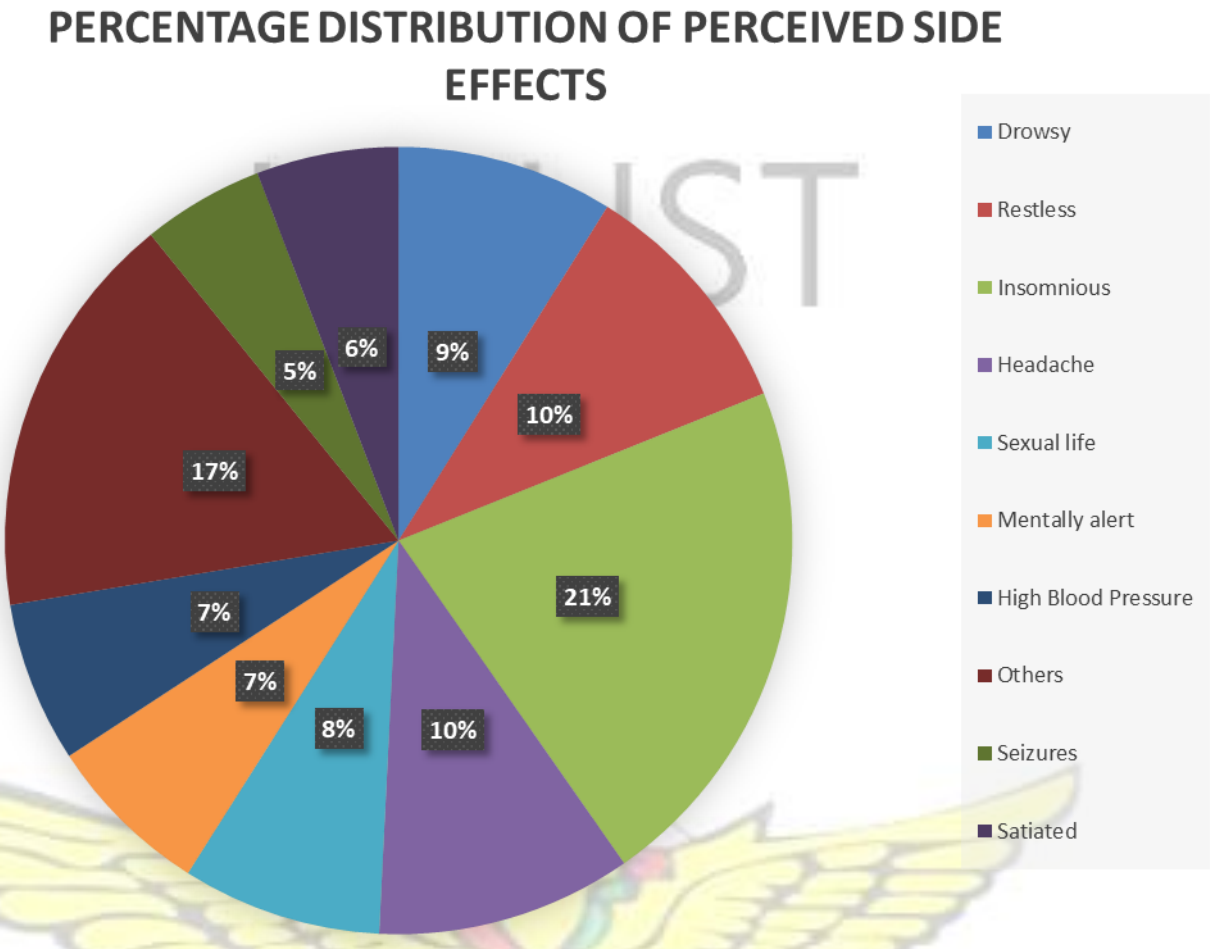


Figure 4.1: Perceived effects of energy drinks on consumers

Overall, most respondents (>50%) recorded that they had not experienced any side effects. Insomnia had the highest occurrence (38.4%) while Not drunk if mixed with alcohol was the least with 2.3% observations.



Others=Nauseous, Not drunk if mixed with alcohol, Itchy and Addicted

Figure 4.2: Percentage distribution of each perceived side effect to total number of perceived side effects

Nausea, faster heartbeat, not drunk if mixed with alcohol, itchy and addicted had individual representations below 5% and would therefore originally be the least common perceived effects. They however had a combined distribution of 17%. Insomnia was the commonest (21%) side effect produced by consuming energy drink while seizures were the least (5%) common (after combination of the distribution of some side effects). Increase in blood pressure and mental alertness, and restlessness and headache had equal distributions at 7% and 10% respectively.

CHAPTER FIVE

5.0 DISCUSSION

The purpose of this study was to determine the prevalence of energy drinks consumption among light industrial workers and also identity various energy drinks on the Ghanaian market, to find out motivators of energy drink consumption among them and know some perceived effects after consuming energy drinks.

5.1 PREVALENCE OF ENERGY DRINKS CONSUMPTION AND VARIOUS ENERGY DRINKS ON THE GHANAIAN MARKET

Unfortunately, no previous work had been done on energy drink usage among Ghanaian Light Industrial workers. The prevalence in this study was found to be 81.1% which is higher than the energy drink usage prevalence of 62.2% found among Ghanaian student athletes by Buxton and Hagan (2012). However, Buxton and Hagan (2012) measured their prevalence over one-week period compared to the one-month period this study measured the prevalence in. The higher prevalence recorded in this study may therefore be due to the wider period which is more likely to record a lot more people using energy drink. Again, the prevalence recorded in this study is higher than the ever used prevalence of 64.9% recorded by Ballistrerri and Corradi-Webster (2008) among physical education students in Rosario, Argentina. Eventhough Ballistrerri and Corradi-Webster's study covered a wider study period, the prevalence recorded in this study was higher because this study was carried out among light industrial workers whose work are physically demanding and are therefore more likely to patronize energy drinks with the belief that they will obtain energy for their work. The higher prevalence is therefore expected.

In a study by Qamhia (2011), majority (79.9%) of the study participants who were not consuming energy drinks said their reason for not consuming was that they might not be healthy.

This is similar to findings made in this study where "They might not be healthy" was also the commonest reason (47.5%) given by those who did not consume energy drink. This belief may stem from the caffeine and excess sugar content of energy drinks which may affect the physiological and metabolic function of the human body.

Table 4.2 depicts some energy drinks available on the Ghanaian market. Storm Energy drink was the most consumed brand of energy drink (27.9%). According to Ajzen's TPB, subjective norm, which is the belief that a significant other approves or disapproves of a behavior, has an effect on the behaviour of a person. "Shatta Wale", a popular Ghanaian musician, who is the face behind Storm's advertisement is a significant other to most Ghanaian youth and young adults. According to the 2010 National Youth Policy of Ghana, the youth comprise people aged 18 to 35. From table 4.1, it can be observed that majority (about 82.8%) of light industrial workers fall within this age bracket and may therefore be influenced by "Shatta Wale". His link to Storm may therefore be accountable for the high patronage of this brand. 5 Star which was the second commonest brand, is the cheapest energy drink brand in the Suame-Magazine environs: priced at ¢2.50. The price which makes it averagely affordable for most of the workers may therefore be the reason for 5 Star being the second preferred energy drink among this study population. Rush which is equally cheap was the least patronized (0.9%). During the various interaction sessions with study participants, several disclosed that Rush energy drink was at the time infrequent and hence less accessible. According to MaCarthy's theory of social marketing (Akhtar and Bhattacharjee, 2013) availability and accessibility are elements of Place which is a component of the four Ps of social marketing.

Thus, the more available a product is, the higher patronage it will receive and vice versa. Unobtainability may therefore account for rush energy drink being the least patronized.

In a study conducted by Buxton and Hagan (2012), the weekly intake of majority of student athletes was between 1 and 2 cans compared to the higher 4.55±2.72 cans recorded in this study. The difference may be due to the physically demanding nature of the work of light industrial workers. The difference may also be due to the high number of working hours (58.58 ± 10.02) within the week for light industrial workers as compared to the average of 20hours for weekly training recorded by Simons *et al*. (1999) among student athletes. The nature of work and numbers of hours spent at work may therefore be the cause of the difference. From table 4.3, it can be observed that none of the participants consumed alcoholic energy drinks on a daily basis. The nine (9) respondents who patronized alcoholic energy drinks submitted that they only did so during weekends when they were unwinding from the week's stress. This therefore accounts for the zero daily patronage of alcoholic energy drinks. Overall, the mean number of cans of nonalcoholic drinks consumed was higher than that for alcoholic drinks. Cooper *et al*., (2015) found that taking alcohol to relax accounted for only 8% of the reasons why people consumed alcohol. This is in line with respondents in this study admitting that they mostly took alcohol (alcoholic energy drink in this case) only on weekends when relaxing. Thus, the differences in the mean number of cans for alcoholic and non-alcoholic energy drinks may be due to the former being consumed mostly during distressing times which usually have fewer occurrences.

5.2 MOTIVATORS OF ENERGY DRINK CONSUMPTION

From table 4.4, it can be observed that majority (75.5%) of the study participants agreed to taking energy drink to increase/ replenish energy, as their reason for taking energy drink. This is higher

than the 50.1% recorded by Reid *et al*. (2015) for the same reason among University students in a Caribbean country. Since the work of light industrial workers is physically demanding, it requires a constant supply of energy. The energy drink is therefore taken to serve as an energy booster for work or a replenisher for lost energy after work which most study participants admitted to. Chang *et al*. (2017) in a study among undergraduate students in Taiwan recorded that only 31.3% of study participants enjoyed the flavor of energy drinks, compared to the 60.4% of people in this study who admitted that energy drinks taste good. Mojet *et al*., (2003) reported that perception of the intensity of tastants dissolved in water significantly differed with age. Thus, young people are more likely to perceive unpleasant tastes than older people. Chang *et al*.'s study had a mean age of 23.1± 4.0years for study participants while this study reported a mean age of 31.50 ± 10.40years ranging from 18 to 60 years and above. Thus, this study had relatively older people than Chang *et al*.'s study. The percentage differences in agreement to energy drinks tasting good may therefore be due to decreased sensitivity of taste of study participants in this study, who therefore perceived energy drinks to taste good. However, another study by Qamhia (2011) revealed that 59.3% of study participants said they enjoyed the taste of energy drinks. The similarity in percentage with this study may be due to the sweet fruity flavors some energy drinks contain (Simon & Mosher, 2007).

Again, from table 4.4, it can be observed that 85.2% of respondents disagreed to not being able to function without energy drinks. From the disclosure of several respondents, they mostly took energy drink after work to replenish lost energy and rarely took it during work hours. They therefore submitted that they could rely on their own strength for their daily work activities and as such, function without energy drink. It can also be observed in table 4.4 that being influenced by friends, athletes and celebrities were highly disagreed to (21.2% and 20.6% respectively).

This is similar with findings by Olatona *et al*. (2018) among Nigerian footballs where 25.1% of participants agreed to being influenced by their friends. It is however lower than the percentage of 59.2% recorded by Arpaci *et al*. (2010) among physical education and sports students in Turkey. This could mean that Africans are less affected by peer pressure in relation to energy drink consumption. It may also be that they hardly admit to being influenced due to their ego and the possibility of being tagged as gullible. These may therefore account for the high percentages for these factors being disagreed to.

From table 4.5, it can be observed that category of work (occupation) was significantly ($p<0.05$) associated with intake of energy drink, just like in Olatona *et al*.'s (2018) study where occupation was significantly associated with energy drink consumption ($p<0.05$). With energy drinks mainly known for boosting physical strength and improving cognitive performance, it could be that workers resort to energy drink for this reason to boost their work performance.

Furthermore, the more physically demanding an individual's activity is, the more likely he/she will search for ways to boost his/her energy level. The different categories of work differ in the level of energy required. It should therefore be expected that a category of work which is more physically demanding will have workers looking for avenues to increase their energy level. Sale of engineering materials and automobile spare-parts involves regular lifting of merchandise for customers, which require energy (Adu-Gyamfi and Adjei, 2018). This may therefore account for workers in the Sales of engineering and automobile category recording the highest percentage of energy drink consumers (28.8%).

Rios *et al*., (2013) in a study among Puerto Rican college students found that energy drink usage was greater among males (35.6%) than females (18.9%). From table 4.6, it can be observed that

male light industrial workers were more probable to patronize energy drink for the popular reasons they are known for; increase/replenish energy, improve performance and work for long hours. During the data collection phase of this study, it was observed that females at the SuameMagazine were generally involved in sales of engineering and automobile spare-parts, most of who had shop attendants (mostly males) to lift weighty merchandise. Thus, it was observed that females at the Suame-Magazine seldom expended excess energy at work because they hardly engaged in physically draining activities, unlike their male counterparts. This may therefore account for males in the study population being more likely to consume energy drink for energy/work related reasons.

5.3 PERCEIVED EFFECTS AFTER CONSUMING ENERGY DRINKS

From figure 4.1, it can be observed that majority (>50%) of respondents reported that they had not experienced any of the effects. This is not the same with findings Reid *et al.* (2015) among students in a Caribbeans University where 62.2% had rather experienced side effects. Berman *et al*. (2001) found differences in racial body composition which is inertly likely to cause differences in body metabolism. Nienhueser *et al*, (2011) also stated that some ingredients of energy drinks such as caffeine and guarana altered body metabolism based on dosage. The different percentages of perceived effects in both studies may therefore be due to racial body metabolism differences as this study was carried out among Africans while Reid *et al*.'s was carried out among Caribbeans. The differences may also be due to differences in dosage of the components of energy drinks which in turn caused different body metabolic alterations, leading to differences in response to stimuli, which in this case are the contents of energy drinks.

From figure 4.2, it can be observed that insomnia took the highest chunk of perceived side effects (21%). This is similar with findings by Bulut *et al.* (2014) where insomnia was also the commonest

(13.8%) perceived effect. According to Grandner *et al*. (2014) caffeine being a key component of energy drink and present in the quantities it is typically found in energy drinks, insomnia, nervousness, headache and tachycardia are the commonly reported side effects. Again, guarana, another component of energy drink, is the highest containing caffeine plant. Thus, guarana contributes additional caffeine to energy drinks. The link to insomnia is due to caffeine's antagonistic action against Adenosine A1 and A2a receptors which are responsible for slowing down neural activity, subsequently leading to sleep. In addition, the insomnia may be caused by hyperactivity owing to the excess sugar content of energy drinks, which will in turn make it difficult for a consumer to fall asleep. L-Carnitine, an amino acid also sometimes present in energy drinks, have been linked to restlessness when taken in excess amounts (Kallmyer, 2018). The hyperactivity from sugar or overdose of L-Carnitine may be the cause of restlessness which also accounted 10% of the perceived side effects.

The low percentage recorded in this study (<5%) for respondents who said they were not drunk when they took energy drink with alcohol may be due to the few respondents who consumed alcoholic energy drinks. Thus, since few people consumed energy drink with alcohol, then only a few people will experience this side effect, hence the low percentage recorded. However, it should be noted that some people presume that energy drink counteract the intoxicative effect of alcohol, which is likely to be a misconception (Verster *et al*., 2012).

A study by Jimo and Bakare (2014) among University students in Nigeria recorded 2.9% people admitting that they experienced itchiness after consuming energy drinks. This is line with the equally low percentage (less than 5%) recorded in this study, as indicated in figure 4.2. Drucker *et al*. (2017) revealed that Niacin (Vitamin B3) is sometimes added to energy drinks with the intention

of helping convert food into energy. However, Niacin in excess amounts have been linked to burning, tingling, itching and redness in the face, arms and chest. The low percentage recorded for this effect in this study may therefore be that only a few respondents consumed Niacin-containing energy drinks in excess quantities. Again, the caffeine component of energy drink makes it addictive, as it may be constantly relied on to boost energy and cognitive performance (El-Sabban, 2016). The low percentage (less than 5%) recorded may be because respondents did not want to be regarded as having an addiction due to stereotype and stigmatization surrounding any form of addiction. Hammond *et al* (2018) recorded 5.1% affirmative response to experiencing Nausea/Vomitting/diarrhea among youth and young adults in Canada, which is similar to the low percentage (less than 5%) recorded in this study for Nausea. after energy drink consumption. Overdose of L-Carnitine has also been implicated in nausea after consuming energy drink. The low percentage of nausea recorded for both studies may therefore be because a few respondents overdosed on L-Carnitine.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

This chapter summarizes the key findings of the study and presents a conclusion to the research. The section also provides recommendations realized from the study.

6.1 CONCLUSION

At the end of this study, it can be concluded that the prevalence of energy drink consumption among light industrial workers at the Suame-Magazine is 81.1%, with category of work and drinking to increase/replenish energy and improve performance, and for its taste being the main motivators of energy drink consumption amongst this population. In order of decreasing popularity and patronage, the energy drink brands identified were Storm (27.9%), 5 Star (23.6%), Run (13.9%), Lucozade (13.4%), Blue Jeans (6.7%), Coca-Cola (6.4%), Red Bull (2.9%), Rox (2.6%), Wellman (1.7%) and Rush (0.9%). Insomnia was the commonest perceived effect while nausea, “not drunk even if mixed with alcohol”, Itchiness and “addicted” together, were the least common perceived effects (each less than 5%).

6.2 RECOMMENDATIONS

- Experimental studies should be done to truly ascertain if the reported effects are caused by the intake of energy drinks.
- There should be intensification in awareness on the hazards of energy drinks. Health education should be increased on the need to moderate energy drink intake among light industrial workers at the Suame-Magazine.

- The Food and Drugs Authority should enforce strict regulations on the production and sale of energy drinks to control the number and quality of energy drink brands available on the Ghanaian market.

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APPENDICES

APPENDIX A: PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

This leaflet must be given to all prospective participants to enable them know enough about the research before deciding to or not to participate

Title of Research:

"Energy Drinks" usage among Light Industrial Workers at Suame-Magazine, Kumasi: Motivators and Effects.

Name(s) and affiliation(s) of researcher(s):

This study is being conducted by Daniel Ansah Obese of the Department of Health Education and Promotion, Kwame Nkrumah University of Science and Technology, Kumasi.

Background (Please explain simply and briefly what the study is about):

Energy drinks are beverages that contain caffeine, taurine, ginseng, guarana, vitamins, herbal supplements and sugar. For the most part, energy drinks are non-nutritive and usually contain caffeine and sugar in excess amounts. Energy drinks are said to have stimulant effects, and they aim to increase alertness, stamina, physical performance and concentration.

It has therefore been observed that workers in light industries habitually consume energy drinks with the intention of increasing their work output. Usage of energy drinks have been observed to have augmented considerably in current years. This observed increase is especially true among occupations such as mining and resources, construction, agriculture and transport where male workers dominate in numbers. This study seeks to analyze the factors or motivators that influence

the consumption of energy drinks among these light industrial workers, especially when there are lots of marketing strategies promoting these drinks using students, athletes and manual workers.

Purpose of research: The principal objective of the study is to assess the extent of usage of the various Energy drinks on the market and identify the motivators and effects among the LightIndustrial workers in Suame-Magazine, Kumasi.

Procedure of the research, what shall be required of each participant and approximate total number of participants that would be involved in the research:

The participants will be visited at their work places in the Suame Magazine environs, to be interacted with regarding the research. The participant information leaflet will be given to those who have met the inclusion criteria and have been randomly selected to be included in the study. A brief additional explanation will also be offered and those willing to partake in the study will be asked to append their signatures on a consent form before the start of the process. Those consenting will then be given a questionnaire to answer with the help of a research assistant.

In total 424 participants will be recruited into this study throughout the study area.

Risk(s): Participants will feel no pain during the interaction with the research assistant. This session will only take few minutes from their busy schedule.

Benefit(s): The data gathered in the study would add to the local database that can be accessible to all, including policy makers who could use the collected data for formulation of public nutrition policies. The general public can thus, equally utilize the outcome and recommendations to their

benefit. Grey areas identified by the research will trigger further investigations by researchers which could eventually contribute to the improvement of the quality of life of the population.

Confidentiality: All information collected in this study will be given code numbers. No name will be recorded. Data collected cannot be linked to you in anyway. No name or identifier will be used in any publication or reports from this study. However, as part of our responsibility to conduct this research properly, we may allow officials from the ethics committee to have access to your records.

Voluntariness: Participation in this study is voluntary and participants are at liberty to end their involvement at any stage. Participants are however encouraged to partake in the exercise till the end, due to the immense benefits of the research.

Alternatives to participation: The researchers will need the consent of participants before they participate in the research and there are no consequences of any sort if you choose to opt out of the research.

Withdrawal from the research: You may choose to withdraw from the research at any time without having to explain yourself. You may also choose not to answer any question you find uncomfortable or private.

Consequence of Withdrawal: There will be no consequence if you choose to withdraw from the study. Please note however, that some of the information that may have been obtained from you without identifiers, before you chose to withdraw, may have been modified or used in analysis reports and publications. These cannot be removed anymore. We do promise to make good faith effort to comply with your wishes as much as practicable.

Costs/Compensation: For your time, we will compensate you with nutritional counselling for your participation. It will encourage positive practices to stay healthy.

Contacts: If you have any question concerning this study, please do not hesitate to contact Daniel Ansah Obese on 0272574701 or to the **Department of Health Education and Promotion**, KNUST, Kumasi.

Further, if you have any concern about the conduct of this study, your welfare or your rights as a research participant, you may contact:

The Office of the Chairman

Committee on Human Research and Publication Ethics

Kumasi

Tel: 03220 63248 or 020 5453785

CONSENT FORM

Statement of person obtaining informed consent:

I have fully explained this research to…….. and have given sufficient information about the study, including that on procedures, risks and benefits, to enable the prospective participant make an informed decision to or not to participate.

DATE:…… NAME:……

Statement of person giving consent:

I have read the information on this study/research or have had it translated into a language I understand. I have also talked it over with interviewer to my satisfaction. I understand that my participation is voluntary (no compulsory).

I know enough about the purpose, methods, risks and benefits of research study to decide that I want to take part in it.

I understand that I may freely stop being part of this study at any time without having to explain myself.

I have received a copy of this information leaflet and consent form to keep for myself.

NAME:……

DATE:……SIGNATURE/THUMB PRINT:……

Statement of person witnessing consent (Process for Non-Literate participant)

I ……. (Name of Witness) certify that information given to……. (Name of Participant), in the local language, is a true reflection of what I have read from the study Participant Information Leaflet, attached.

WITNESS' SIGNATURE (maintain if participant is non-literate)…….

APPENDIX B: QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF HEALTH EDUCATION AND PROMOTION

Study Title: "Energy Drinks" Usage among Light Industrial Workers at Suame-Magazine, Kumasi: Motivators and Effects.

PERSONAL DATA OF RESPONDENTS

Telephone No.:……

Date:…… Code:……...

Section I: Socio-demographic information

This section is designed to obtain demographic information of the participants. Please respond to each of the questions by checking the statements that best apply to you or by filling in the blanks.

1. What is your gender? □ Male □ Female

2. How old are you? .....

3. Which ethnic group do you belong to?

□ Akan □ Ewe □ Ga/Dangbe □ Northerner □ Guan □ Others, please specify ----------

4. What is your highest educational level attained?

□ No Formal Education □ Primary (Elementary) School □ Senior High □ Tertiary

□ Other (please specify)

5. What category of work do you do as a light industrial worker?

□ Manufacturing □ Vehicle repair □ Metalworking □ Sale of engineering materials and automobile spare-parts □ Others, specify……

6. What is your average monthly income?

□< ¢200 □¢200 - ¢1000 □¢1000 - ¢2500 □¢2500 - 5000 □ > ¢5000

7. How many hours do you work per week?----------

8. Have you ever consumed energy drinks before? □ Yes □No

9. If no, why? (Select the best one that appeals to you)

□ I heard they do not taste good
□ They are expensive
□ They might not be healthy
□ I am just not interested in them
□ I heard one does not feel okay when he/she drinks them
□ Other (please specify)……..

Section II: Behaviour and Attitude

This section is designed to collect information regarding consumers' purchase preferences and habits of energy drinks.

a. Various kinds of Energy Drinks consumed

10. Which brand of energy drink do you consume the most?

□ Red Bull □ 5 Star □ Run □ Coca-Cola □ Blue Jeans □ Lucozade □ Storm
□ Rox □ Kabisa □ Monster □ Other (please specify)…….

11. Please show the frequency of energy drinks consumption (quantities of cans)

Energy Drinks	**Number of Consumption levels; (Quantities) of cans**		
	Daily	Weekly	Monthly
Alcoholic			
Non-Alcoholic			

b. Factors that influence the consumption of energy drinks

12. Please indicate the reasons that motivate your energy drinks consumption, using the 5-point scale with 1 being "strongly disagree" and 5 being "strongly agree".

Motivators	**Strongly Disagree (1)**	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly Agree (5)**
Compensate for insufficient sleep					
Increase/Replenish energy after work					
Improve mood					
Improve performance					
Hydration of the body					
Energy drinks are affordable					
My friends influenced me					
I can't function without energy drinks					
Athletes and celebrities drink energy drinks, so do I					
Energy drinks mean youth & strength					
Energy drinks taste good					
Help me to work for long hours.					
I am enticed by their commercials					
I like trying new products that's why I drink energy drinks.					
Energy drink containers are appealing to the eyes, so they are attractive to me.					
Drink them without specific reason					

c. Perceived effects after consuming energy drinks.

13. When I consume energy drinks, I feel ------- (Please select all that are applicable to you by putting √)

- □ Drowsy
- □ Restless
- □ Insomnious/Sleep disturbed
- □ Nauseous
- □ Agitated
- □ Jolt/Crash episode/Seizures
- □ Satiated
- □ My heart beat faster than before
- □ Not drunk even if I mix them with alcohol
- □ Mentally alert
- □ It improves my sexual life
- □ Itchy
- □ Headache
- □ My blood pressure rises
- □ Addicted
- □ Others, please specify……..

Name of Interviewer…… Signature……..

APPENDIX C: ETHICAL CLEARANCE (LETTER OF APPROVAL)

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICAL SCIENCES / KOMFO ANOKYE TEACHING HOSPITAL
COMMITTEE ON HUMAN RESEARCH, PUBLICATION AND ETHICS

Our Ref: CHRPE/AP/418/19 — 3rd July, 2019.

Mr. Daniel Ansah Obese
Department of Health
Education and Promotion
School of Public Health
KNUST-KUMASI.

Dear Sir,

LETTER OF APPROVAL

Protocol Title: *"Energy Drinks' Usage among Light Industrial Workers at Suame-Magazine, Kumasi: Motivators and Effects."*

Proposed Site: *Suame-Magazine, Kumasi.*

Sponsor: *Principal Investigator.*

Your submission to the Committee on Human Research, Publications and Ethics on the above-named protocol refers.

The Committee reviewed the following documents:

- A notification letter of 6th May, 2019 from the Department of Health Education and Promotion, KNUST seeking permission to conduct the study at Suame Municipality (study site) and it was approved.
- A Completed CHRPE Application Form.
- Participant Information Leaflet and Consent Form.
- Research Protocol.
- Questionnaire.

The Committee has considered the ethical merit of your submission and approved the protocol. The approval is for a fixed period of one year, beginning 3rd July, 2019 to 2nd July, 2020 renewable thereafter. The Committee may however, suspend or withdraw ethical approval at any time if your study is found to contravene the approved protocol.

Data gathered for the study should be used for the approved purposes only. Permission should be sought from the Committee if any amendment to the protocol or use, other than submitted, is made of your research data.

The Committee should be notified of the actual start date of the project and would expect a report on your study, annually or at the close of the project, whichever one comes first. It should also be informed of any publication arising from the study.

Thank you, Sir, for your application.

Yours faithfully,

Osomfo Prof. Sir J. W. Acheampong MD, FWACP
Chairman

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